Empirical Investigation of Autonomy and Motivation*

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Abstract

I study the effect of workers' motivation on the firm's choice of how much autonomy employees should be given. The main hypothesis of the paper is that employers give autonomy to workers who are already especially motivated. The empirical work is based on data from Wave 1 of the Health and Retirement Survey (HRS), a nationally representative longitudinal study of health, retirement, and aging. The HRS provides unique information on individual's motives and autonomy on the job. Estimating a continuous latent variable model, I find evidence that motivated workers are more likely to be in autonomous jobs, and that they receive higher wages in autonomous jobs.

JEL code: M54, D83, J24
Keywords: Personnel Management; Intrinsic Motivation; Decentralization

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1 Introduction

Do firms use autonomy to motivate workers, or do they give autonomous jobs to workers who are already especially motivated? Most studies on delegation of responsibility and autonomy concentrate on the conflict between two opposite effects: autonomy stimulates workers to acquire information; however, in giving workers autonomy, employers lose some control over procedures and outcomes. Thus, firms offer autonomous jobs as a nonmonetary incentive to promote worker motivation. But surprisingly, little attention has been given to the details of the practice of giving autonomy to especially motivated workers: for example, does autonomy in fact trigger motivation? In contrast, an observation in the literature on social psychology is that people's job performance and how they handle new information reflect their motives, drives, and emotions.

I study empirically the effect of workers' motivation on the firm's choice of how much autonomy employees should be given. I test whether employers give autonomy to workers who are already especially motivated.

I use data from Wave 1 of the Health and Retirement Survey (HRS), a nationally representative longitudinal study of health, retirement, and aging. The HRS provides unique information on autonomy and motivation.

What motivates people is a question that has been present in the psychology literature for a long time. Deci (1971) developed the idea that people might be driven by motives that reflect their needs and goals. Deci called the resulting motivation intrinsic, in contrast with what is known as externally or extrinsically driven (by rewards) behavior. Intrinsic motivation (IM hereafter) has also been introduced to the management literature (see for example Galbraith, 1977 and Staw, 1989) as the motivation to perform a task, or to achieve specific outcomes. For example, professional pilots enjoy flying, while environmental workers fight for the cause of clean nature. Galbraith and Staw argue that IM can be stimulated by developing a work environment where people can achieve their goals, and

one way to do this is by providing autonomy. Autonomy, however, is a necessary, but not a sufficient condition to induce better performance. Workers have to be interested in the task, i.e., they have to be already motivated to do the job.

If workers are motivated or unmotivated, offering autonomous jobs to unmotivated workers will not necessarily stimulate them to be more motivated. Pyszczynski & Greenberg (1987) and Baumeister & Newman (1994) show that a motivated worker is driven by motivation to search, while an unmotivated worker is driven by motivation to ignore, i.e., motivated people have a lower cost of processing information than unmotivated ones.

Motivated people show enthusiasm for acquiring information that is useful for the production process. A motivated worker will believe that a certain way of doing the job is the one that would bring the best results. He would therefore be discouraged if asked to follow other alternatives. In an organization where employees have no autonomy in decision making, a motivated worker would need stronger incentives to work than an unmotivated worker, who acquires no information about how best to get the job done. It follows that the employer may find it optimal to give autonomy to motivated workers, but not to the unmotivated ones.

The introduction of motivation to the discussion suggests some empirical predictions. If motivated people place a lower cost on processing information, then autonomy is less costly for motivated people than for unmotivated ones. Therefore, holding other things constant, motivated people will prefer autonomous jobs. Furthermore, employers would value motivated people in autonomous jobs more highly than unmotivated people in autonomous jobs. I find evidence that employers are willing to pay motivated people in autonomous jobs higher wages than unmotivated people in autonomous jobs.

2 Literature Review

Standard assumption in microeconomics is that effort is costly and brings disutility. But if intrinsically motivated people enjoy working, they will experience positive utility of effort. (See Fehr & Falk, 2001). In contrast, findings from psychology demonstrate that people may not always have an increasing effort cost. Classic examples are experimental settings (Deci & Ryan, 1985) where participants perform tasks without being rewarded.

The initial studies on IM are attempts to deal with the possibility that monetary incentives might crowd-out IM (Frey, 1997 and Frey & Oberholzer-Gee, 1997). Benabou & Tirole (2002) offer a cognitive perspective to IM in a signaling model where the employer has private information about the worker's ability or the nature of the task. Workers conclude what their motivation is based on a signal received from the employer. Therefore, workers in autonomous job might think that the employer trusts them or values their work. The implication is that autonomy inspires motivation. This approach is an application of the psychological theory of self-perception developed by Bem (1972).

There are very few studies generating the prediction that autonomy is offered to workers who are already motivated. Murdock (2002) employs the idea that people are motivated by the outcomes of their work (Staw, 1989). Consider, for example, the personal satisfaction achieved from introducing a new medicine. Murdock calls these outcomes intrinsic returns (for the worker). A motivated worker would choose to participate in a project with high intrinsic returns, even when it brings financial loss. The employer can still gain from accepting such a project, given that the total surplus from all projects is positive. The implication of this model is that autonomy, rather than inspiring motivation, is given to intrinsically motivated employees.

I now turn to the literature on autonomy and decision rights. The main observation in this literature is that autonomy is determined by the structure of information. A study that is closely related to the present paper is Aghion & Tirole (1997). They investigate

the two-way interaction between authority and information, where "real authority" is defined as the "effective control over decisions in organizations." Autonomy stimulates the workers' initiative to acquire information, but it usually comes with some costs. Employers lose control from not being able to exercise their power over all decisions. Losses of information are also possible. The model has certain implications for the delegation of decision-making rights: delegation is more likely when the employer trusts the worker, or when the activities are innovative and the employer does not have prior experience in the area.

3 Data

The HRS Wave 1 data collection was completed in 1992, and covers 12,521 men and women, born between 1931 and 1941. I have constructed a sample including 6,375 people. Those without jobs and the self-employed are excluded from the sample. People with a wage rate below a $1 per hour and those with more than $150 per hour are excluded as well. Respondents are classified as motivated if they strongly agreed or agreed with the question addressing motivation. Second group, classified as unmotivated includes people who disagreed or strongly disagreed with the statement. Table 1 presents the sample distribution of the answers.

More than 50 percent of the sample agreed that they would work even if they did not need the money, while only 12 percent strongly agreed. This result holds for both males and females, with the more impressive 55 percent for females. Approximately a quarter of the sample disagreed, for both males and females; and less than 10 percent strongly rejected the possibility of working when they would not need the money.

Table 1 - Even if I didn't need the money, I would probably keep on working

	Male		*Female*		*All*	
	number	proportion	number	proportion	number	proportion
strongly agree	372	0.12	403	0.12	775	0.12
agree	1, 568	0.52	1, 848	0.55	3, 416	0.54
disagree	781	0.26	832	0.25	1, 613	0.25
strongly disagree	298	0.10	273	0.08	571	0.09
Total	**3, 019**	**0.47**	**3, 356**	**0.53**	**6, 375**	**100**

Source:HRS Wave 1 (1992).

Table 2 reports the sample descriptive statistics by motivation. Respondents answer the autonomy question with: all or almost all of the time, most of the time, some of the time, none or almost none of the time. Thirty percent of the sample reported having freedom all or almost all of the time. These people form the autonomous group.

Table 2 - Sample descriptive statistics by motivation

	Motivated		Umotivated		All	
	mean	st.dev.	mean	st.dev.	mean	st.dev.
Autonomy	0.35	0.48	0.26	0.44	0.32	0.47
Male	0.46	0.50	0.49	0.50	0.47	0.50
White	0.75	0.43	0.72	0.45	0.74	0.44
Years of educ.	13	3	12	3	13	3
Experience	36	6	37	6	36	6
Union	0.23	0.42	0.33	0.47	0.26	0.44
Hourly wage	12.43	8.02	12.69	7.48	12.52	7.84
Hours per year	2015	620	2035	539	2022	593
N:	4191		2184		6375	

Source:HRS Wave 1 (1992).

The most important differences between the motivated group and the unmotivated one are in terms of autonomy, experience, union status, and wage. Among those that are motivated, 35 percent hold autonomous jobs, while this number is only 25 percent for the group of the unmotivated people. Further, only 23 percent among the motivated are union members, vs. 33 percent among the unmotivated. One possible interpretation would be that motivated people do not need the security provided by a union membership. If this

is true, it might be reflected in the wage. The difference in the hourly wage shows that the motivated have relatively lower wages than the unmotivated. In addition to this, they have relatively less experience.

4 Exploratory Empirical Analysis

I provide in this section expiratory empirical analysis that is helpful for comparing motivated versus unmotivated workers. HRS includes job descriptive characteristics, such as physical effort, concentration of attention, repetition of operations, learning new things, freedom to decide how to work, skills in dealing with other people, and stress. Some of those characteristics might be more distinctive for motivated people, while others apply to unmotivated people only. For example, one might expect that those who are intrinsically motivated have jobs that do not require physical effort, repetition of operations, or high stress burden. Instead, they have a lot of freedom to decide how to do their jobs and face the challenge of learning new things.

The HRS also provides information on workers' marginal wage. That is, the wage that would be received for working one extra hour. One hypothesis would be that people with zero (or close to zero) marginal wage belong to the group of those that are intrinsically motivated. Alternatively, those with a high marginal wage are extrinsically motivated.

4.1 Job Descriptive Characteristics

I further proceed with some job descriptive characteristics. Respondents answered one group of questions describing different aspects of their jobs. The responses to these questions are contrasted for the two groups of intrinsically vs. extrinsically motivated individuals. In addition, I separate a set of characteristics where motivation matter from those for which motivation makes no difference.

4.1.1 First Set of Characteristics - Motivation Matters

Figures 1-3 present the characteristics where motivation matters. Respondents are asked whether 'they do the same things over and over again', 'learn new things' and 'have a lot of freedom to decide how to do their own work'.

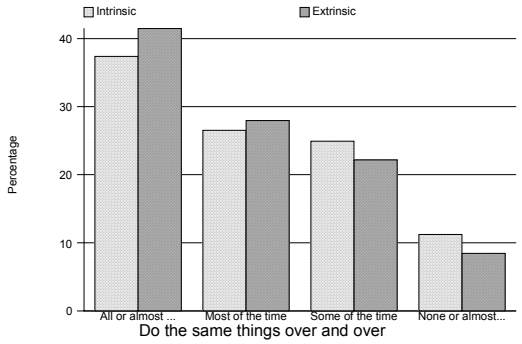

Figure 1

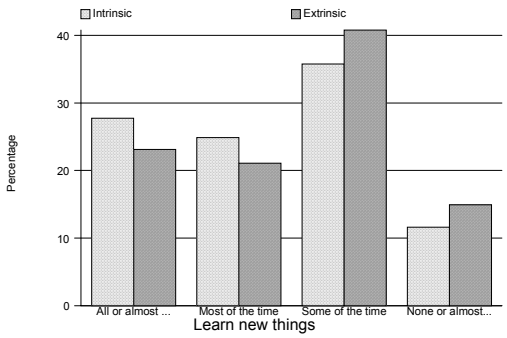

Figure 2

The difference between the answers of intrinsically versus extrinsically motivated workers on both Figure 1 and Figure 2 is not big. On Figure 1, difference between the answers of intrinsically versus extrinsically motivated workers for those who choose 'All or almost all of the time' is significant at the 5 percent level. The same holds for the first three choices (All or almost all of the time, Most of the time, Some of the time) on Figure 2. One might expect, however, that repeating the same operations over and over again is not an element of intrinsically motivated behavior.

On Figure 3, 41 percent of those considered to be intrinsically motivated have a lot of discretion on how to do their jobs, while only 30 percent of the respondents from the extrinsically motivated group have freedom. The data supports the cognitive evaluation theory as well. The 'freedom to decide' is called self-determination in this theory; people who are intrinsically motivated have high sense of self-determination.

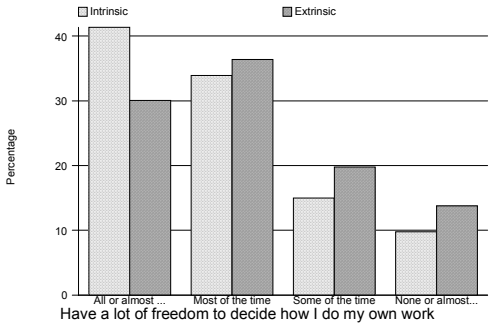

Figure 3

4.1.2 Second Set of Characteristics - Motivation Makes No Difference

The second set of characteristics includes characteristics that seem to make no difference for motivation. Respondents have to access 'physical effort', 'skills in dealing with other people', 'keep up with the pace set by others' and 'stress' as factors. Both groups exhibit the same pattern of answers, and the small differences shown on the figures are not statistically significant.

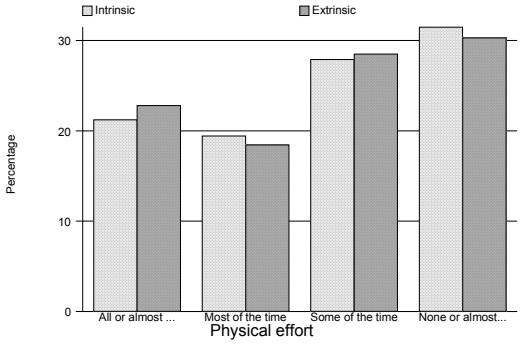

Figure 4

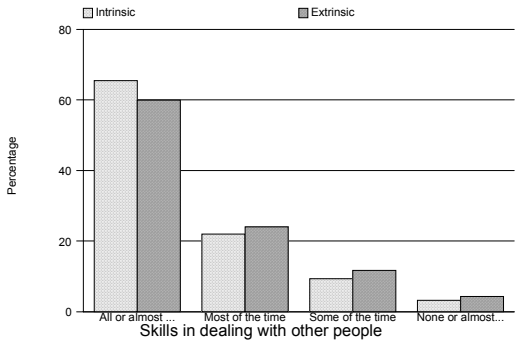

Figure 5

The case of physical effort might be viewed as surprising, since one might expect this feature to be a characteristic of predominantly extrinsically motivated behavior.

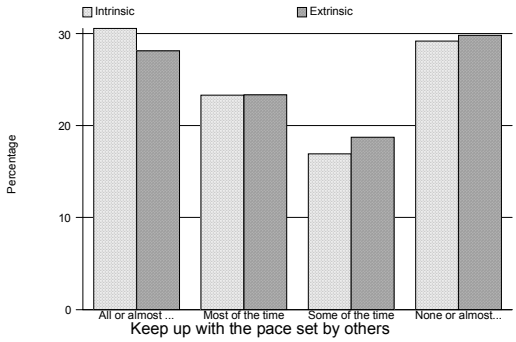

Figure 6

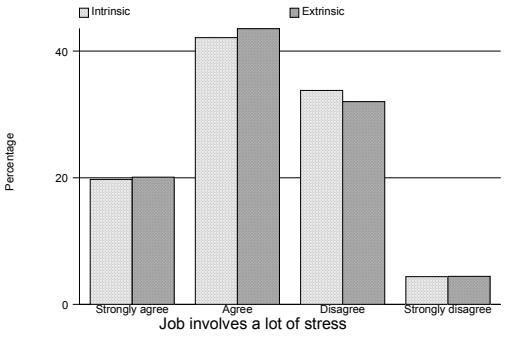

Figure 7

4.2 Extra Hours Work

I present here how the behavior of the groups varies with the amount of compensation for extra hours work. The whole sample consists of four categories formed on the base of their type of pay. These are salaried workers, hourly paid, workers with piece rates and commissions, and other types of pay. The largest group is the group of hourly paid workers, 56 percent. Those with salaries are 40.3 percent of the sample. I observe these two groups only. Figure 8 shows the percentage of salaried workers with and without compensation for extra time work. The difference in the responses between the intrinsically and extrinsically motivated groups is nonsignificant. This is not a surprising result when we take into account the specificity of salaried jobs.

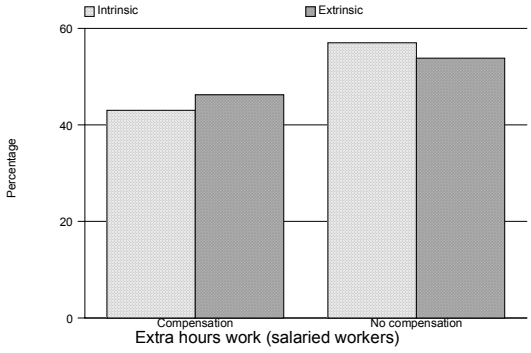

Figure 8

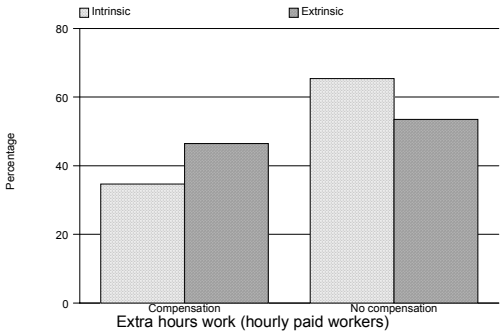

Figure 9

Things are different for hourly paid workers. 34 percent of the respondents from the intrinsically motivated group vs. 48 from the extrinsically motivated one have compensation for working extra hours. When there is no compensation the result is reversed, and

the gap is even bigger and statistically significant at the 5 percent level. This behavioral pattern is different. The separation between intrinsically motivated respondents with and those without compensation is clearer, 34 vs. 66 percent.

The last figure in this section shows what percentage of the respondents in the two groups is required to work overtime. It confirms the expectation that intrinsically motivated people are more likely to have extended working hours. The pattern pointed out in the previous figure appears here as well.

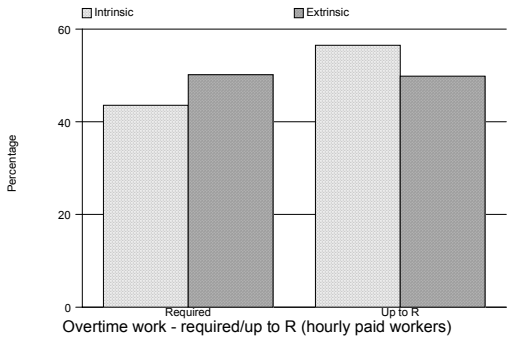

Figure 10

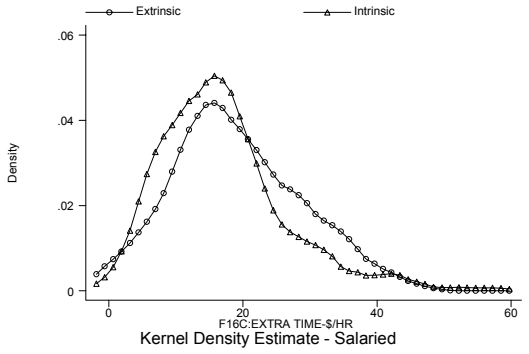

Figure 11

4.3 Marginal Rate

In this section, I exploit the information on marginal wages applying kernel density estimation of the marginal wage rate. Respondents answer the following question: If you worked an extra hour, how much would you earn for that hour? Based on this information, I calculate an hourly wage for this additional hour and perform the kernel density estimation for salaried and hourly paid workers only. In the case of piece rates, commissions, and other types of pay the number of observations is very small, with many outliers.

I also apply kernel density estimation of the marginal wage rate to the whole sample. The result is presented on Figure 13. One can see that for marginal wages between zero and five the two densities drop sharply. The effect is more explicit for the intrinsically motivated group. However, for zero marginal wages, the density of the intrinsically motivated group is far above the density of the group with extrinsic motivation. I construct further

the cumulative density functions of the two groups. My hypothesis is that at least for the first half of the range between 0 and 40 dollars marginal hourly wage, the cumulative density function of the intrinsically motivated group is above the one of the extrinsically motivated group. The explanation in mind would be that intrinsically motivated people are more willing to work for a lower payment. Indeed, this is the result presented on Figure 14. I also apply a two-sample test for equality of distribution functions. The test confirms that the observed difference in the marginal wage between the two groups is statistically significant.

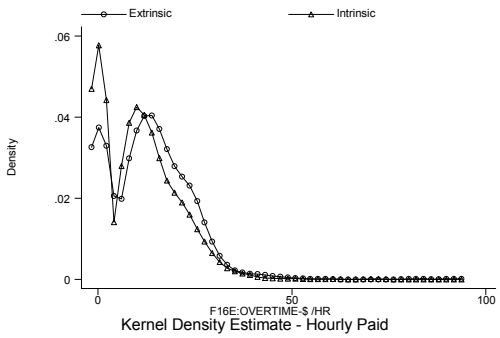

Figure 12

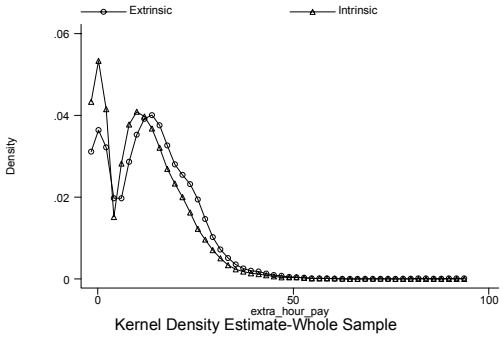

Figure 13

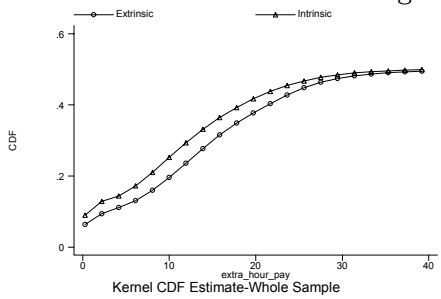

Figure 14

5 Empirical Model and Estimation

I apply a continuous latent variable model. The job consists of two dimensions: wage rate, W, and a non-wage job attribute, autonomy, A. Thus, the wage, W_0, offered by the employer defines the set of jobs determined by the wage and nonwage component,

available to a worker with human capital X and motivation M is:

$$W_0 = X\beta + \alpha_1 M + \alpha_2 MA + \alpha_3 A + \varepsilon. \tag{1}$$

X includes variables such as age, education, and labor market experience, which can be observed, together with some unobservable variables, such as intelligence, ability to work in a group, etc. I assume that a job with autonomy is more costly to the firm and pays less to the employee. Employers incur losses of information and control. If all workers prefer autonomy, firms have to offer higher wages for less autonomous jobs. Let α_3 denote the compensating wage differential associated with autonomy. This is the forgone wage for accepting a job with a higher level of discretion. Let α_2 be the wage differential for a motivated person.

Among workers, there is heterogeneity in the monetary value, V^*, of working in an autonomous job:

$$V^* = Z\Gamma + \gamma M + v, \tag{2}$$

where Z is a vector of characteristics that may also affect preferences for autonomy. Those characteristics are: property rights in jobs, security, flexible time, and establishment size. Property rights in jobs are captured with two different variables. The HRS provides two measures of seniority-based job ladders: first, whether the employer gives younger people preference over older people in decisions about promotion, and second, whether older workers feel the pressure to retire before age 65. The security variable addresses the issue of workers' certainty about keeping their jobs for the year that follows. On a scale from 0 (absolutely no certainty) to 10 (absolutely certainty) they were asked how likely it is that they would lose their jobs during the following year. 'Flexible time' is a dichotomous variable, which takes the value of one if employees work on a flexible schedule.

The value of autonomy, V^*, does not depend on the wage, but rather is the value that every worker places on autonomy, regardless of the wage offered to him. This value

depends on motivation.

The cost of taking an autonomous job for a person with a given set of characteristics X and motivation M is $\alpha_2 M + \alpha_3$. Therefore, people choose autonomous jobs when their value is higher than the cost they would incur:

$$Pr(A = 1|M) = Pr(Z\Gamma + \gamma M + v > \alpha_2 M + \alpha_3) \tag{3}$$

$$= Pr(v > (\alpha_2 - \gamma)M - Z\Gamma + \alpha_3), \tag{4}$$

where $Pr(A = 1|M)$ is the probability of being in an autonomous job given motivation. The model is:

$$W = X\beta + \alpha_1 M + (\alpha_2 M + \alpha_3)A + \varepsilon \tag{5}$$

$$V^* = Z\Gamma + \gamma M + v \tag{6}$$

$$A = 1 \; if \; V^* > \alpha_2 M + \alpha_3 \tag{7}$$

$$A = 0 \text{ otherwise} \tag{8}$$

The error terms (ε, v) are jointly normally distributed. To estimate the system I use the two-stage procedure developed in Heckman (1979). People who place a higher value on autonomy on the job might self-select into certain type of jobs that provide autonomy. If these jobs provide a lower wage, based upon the intuition that autonomy is costly for the firm, then ε and v will be correlated. Alternatively, the jobs with autonomy might come with higher wages in places where monitoring is difficult or cannot be done efficiently. In both cases there will be a correlation between ε and v that requires correction for selection. If (ε, v) are independent, the estimation amounts to applying OLS to equation (1) and a Probit to equation (2).

6 Results

The coefficients in the probit model are reported Table 3. Motivated people value autonomous jobs more than unmotivated people. Males are more likely to prefer autonomy than females. Race and education do not have a significant impact.

Table 3 Probit Model of Autonomy

	(1)	*(2)*	*(3)*	*(4)*
Motivation	0.057**	0.059**	0.059**	0.059**
	(0.012)	(0.012)	(0.012)	(0.012)
Male	0.072**	0.076**	0.076**	0.060**
	(0.013)	(0.013)	(0.013)	(0.012)
White	0.020	0.028*	0.028*	0.022
	(0.014)	(0.014)	(0.014)	(0.014)
Years of Education	0.012**	0.013**	0.013**	0.014**
	(0.002)	(0.002)	(0.002)	(0.002)
Experience	0.003**	0.003**	0.003**	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Ladder1	-0.051**	-0.052**	-0.052**	-0.052**
	(0.018)	(0.017)	(0.017)	(0.017)
Ladder2	-0.076**	-0.075**	-0.075**	-0.082**
	(0.018)	(0.018)	(0.018)	(0.018)
Security	-0.016**	-0.016**	-0.016**	-0.016**
	(0.002)	(0.002)	(0.002)	(0.002)
Flex time	0.085**	0.085**	0.085**	0.089**
	(0.015)	(0.015)	(0.015)	(0.015)
Union Membership	-0.084**	-0.085**	-0.085**	-0.098**
	(0.014)	(0.014)	(0.014)	(0.014)
Industry Dummies	Yes	Yes	Yes	No
Occup. Dummies	Yes	Yes	No	No
Size Dummies	Yes	No	No	No
Observations	6374	6374	6374	6374
Log likelihood	-4008.273	-4008.273	-4008.273	-4008.273

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

The coefficients on the Z variables show that individuals who work in a place where the employer prefers younger people over older in decisions about promotions, or where older workers feel pressure to retire before age 65, hold a lower value of autonomy on the job. It seems that when workers are concerned about keeping their jobs, whether there is autonomy on the job or not is less significant for them. These results reflect the age

profile of the sample. The same holds for people who are certain that they won't be able to keep their jobs for the year that follows. Further, people who have the opportunity to work on flexible time schedules place higher value on autonomous jobs. And finally, union members place a lower value on autonomy on the job. This might be interpreted that workers would prefer unionized versus autonomous jobs. However, one might think that jobs that tend to be unionized provide a lower level of autonomy.

Table 4 Wage Equation

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Motivation	-0.062**	-0.059**	-0.061**	-0.061**	-0.059**
	(0.020)	(0.021)	(0.021)	(0.021)	(0.021)
Autonomy*Motivation	0.062*	0.057*	0.058*	0.058*	0.045
	(0.026)	(0.026)	(0.026)	(0.026)	(0.027)
Autonomy	0.048*	0.051*	0.048*	0.048*	0.046*
	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)
Male	0.250**	0.250**	0.247**	0.247**	0.271**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.014)
White	0.051**	0.056**	0.050**	0.050**	0.059**
	(0.015)	(0.015)	(0.014)	(0.014)	(0.015)
H. worked (per year)	0.000**	0.000**	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Years of Education	0.078**	0.079**	0.080**	0.080**	0.084**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)
Experience	0.022**	0.022**	0.022**	0.022**	0.025**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Experience squared	-0.000**	-0.000**	-0.000**	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Union Membership	0.128**	0.155**	0.155**	0.155**	0.192**
	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)
Industry Dummies	Yes	Yes	Yes	Yes	No
Occup. Dummies	Yes	Yes	Yes	No	No
Size Dummies	Yes	Yes	No	No	No
Region Dummies	Yes	No	No	No	No
Observations	6277	6277	6277	6277	6277
R-squared	0.42	0.41	0.41	0.41	0.38

Robust standard errors in parentheses
* Significant at 5%; ** significant at 1%
Dependent variable is log-hourly wage.

For example, the US Bureau of Labor Statistics reports that in 1998 the highest percentage of US wage and salary workers in the private sector is observed in Transportation, Manufacturing, and Construction. Thus, one cannot conclude that workers prefer union

membership to autonomy on the job.

Since the two error terms, ε and v, turn out to be independent, the estimation procedure is simplified to a simple OLS applied to the wage equation and a Probit to the autonomy equation. The results from the OLS estimation are presented in Table 4.

The human capital variables have standard signs. After controlling for both autonomy and motivation, motivated people in autonomous jobs have higher wages. Therefore, the employer is willing to pay a premium, $\alpha_2 > 0$, to a motivated person in an autonomous job. From the probit equation, I have found that motivated people are more likely to be in autonomous jobs, or $(\alpha_2 - \gamma) > 0$. This result, together with the positively signed γ, means that the premium that the employer pays is greater than the reduction in pay that the worker is willing to accept. It is impossible, however, to find the sign of α_2. The monetary value of autonomy to a motivated person, γ, holding the wage constant, could be positive or negative.

7 Conclusions

I use data from Wave 1 of the Health and Retirement Survey (HRS) that provides unique information on autonomy and individual's motives. I start with an exploratory empirical analysis. My goal is to present some descriptive characteristics that might help understand the very idea of motivation and autonomy as reflected in the data. In particular, it helps with the comparison between motivated and unmotivated workers.

I apply a continuous latent variable model, where both the latent variable and its realized qualitative variable are included in the model. I have find that motivated workers are more likely to be in autonomous jobs, and that they receive higher wages in autonomous jobs than unmotivated workers in autonomous jobs. This implies that employers value motivated workers in autonomous jobs more highly than unmotivated workers in autonomous jobs. Thus, employers would be more willing to give autonomy to motivated

workers.

Also, when there is autonomy on the job, the effect of motivation on the wage is positive but small, while with no autonomy on the job, motivated people get lower wages. Although this result seems to be contradictory at first sight, it reflects some of the properties of the sample under study,mainly, the age profile of the sample. It might reflect, for example, the fact that respondents who answer the question whether they would work if they did not need the money might not necessarily have in mind their motivation to work. But instead, that they would still work to keep their social contacts as opposed to staying at home. Or, they might want to feel helpful, or belong to an organization, or for other reasons that have little or nothing to do with their internal motivation to work. And for these very reasons those people would work even if they might be paid less, or if there is no autonomy on the job. These effects, unfortunately, cannot be separated.

In general, the empirical results support the basic idea of the paper that motivation triggers autonomy and that employers give autonomy to workers who are already especially motivated.

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